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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/751,215	12/29/2000	Andrew Yeoh	042390.P10048	8879

7590 05/04/2004
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EXAMINER


VU, HUNG K

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 05/04/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/751,215	Applicant(s) YEOH, ANDREW	
	Examiner Hung K. Vu	Art Unit 2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 February 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-7 and 18-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,5,6,18,19 and 21 is/are rejected.
- 7) ☒ Claim(s) 3,4,7 and 20 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>07/21/03</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 1 is rejected under 35 U.S.C. 102(e) as being anticipated by Hsiung et al. (PN 6,174,812, of record).

Hsiung et al. discloses, as shown in Figures 3C-3D, a method for forming hardened interconnects comprising:

depositing a metal layer (35) comprising copper and an additional metal species over a semiconductor wafer surface wherein the copper and the additional metal species are co-deposited;

after co-depositing the metal layer comprising the copper and the additional species performing chemical-mechanical polishing of the deposited metal layer comprising copper and the additional metal species. Note that Hsiung et al. teaches the metal layer comprising copper and additional metal species, therefore, it is inherent that the additional metal species hardens the deposited metal layer to reduce the rate of the polishing. [Col. 3, lines 31-43 and Col. 3, line 59-Col. 4, line 3]

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hsiung et al. (PN 6,174,812, of record) in view of Besser (PN 6,368,967, of record).

With regard to claim 5, Hsiung et al discloses all of the claimed limitations except the steps of after allowing the heated metal film to cool performing the chemical-mechanical polishing. However, Besser discloses the steps of after allowing the heated metal film to cool performing the chemical-mechanical polish. Note Figure 7 and Col. 8, lines 52-63 of Besser. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the metal layer of Hsiung et al. including the steps of after allowing the heated metal film to cool performing the chemical-mechanical polishing, such as taught by Besser in order to reduce the hydrostatic mechanical stress of the metal film.

With regard to claim 6, Hsiung et al. and Besser disclose the deposited metal layer is copper.

3. Claims 18, 19 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hsiung et al. (PN 6,174,812, of record) in view of Pramanick et al. (PN 6,117,770, of record).

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With regard to claim 18, Hsiung et al. discloses, as shown in Figures 3C-3D, a method for forming interconnects of integrated circuit comprising:

forming an opening in an insulating film (30);

co-depositing a metal film and an additional metal species (35) over insulating layer and in the opening and filling the opening with the metal film and the additional metal species;

after co-depositing the metal film and the additional metal species into the opening, chemical-mechanical polishing of the deposited metal film with the additional metal species to remove the metal film from over the insulating layer. [Col. 3, lines 31-43 and Col. 3, line 59-Col. 4, line 3]

Hsiung et al. discloses all of the claimed limitations except the insulating film formed over a substrate. However, Pramanick et al. disclose forming an opening in an insulating film (202) formed over a substrate (200). Note Figures 2-4 of Pramanick et al.. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the insulating layer of Hsiung et al. over a substrate, such as taught by Pramanick et al. because it is conventional to form the substrate used as a base layer for form other subsequent layers on the base layer.

With regard to claim 19, Hsiung et al. and Pramanick et al. disclose the metal film comprises copper.

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With regard to claim 21, Hsiung et al. and Pramanick et al. disclose the method further comprising heating the deposited metal film with the introduced metal species prior to performing the chemical mechanical polishing.

Allowable Subject Matter

4. Claims 3, 4, 7 and 20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

5. Applicant's arguments filed 02/09/04 have been fully considered but they are not persuasive.

It is argued, at page 7 of the Remarks, that Hsiung et al. does not teach co-depositing copper and an additional metal species as claimed. This argument is not convincing because Hsiung et al. clearly teaches, as shown in Col. 3, line 59 - Col. 4, line 3, co-depositing copper and an additional metal species. Therefore, Applicant's claim 1 does not distinguish over the Hsiung et al. reference.

It is argued, at page 7 of the Remarks, that Hsiung et al. and Besser do not teach the steps of allowing the heated metal film to cool, so as to form precipitates of the introduced metal species and after allowing the heated metal film to cool performing chemical-mechanical polishing wherein the additional metal precipitate hardens the deposited metal film to reduce the rate of the

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polishing. This argument is not convincing because Besser teaches, as shown in Col. 6, line 54 – Col. 8, line 51, to allow the heated metal film to cool so it is inherent that precipitates will be formed. Besser also teaches, as shown in Col. 8, lines 52 – 63, after allowing the heated metal film to cool performing chemical-mechanical polishing. Therefore, Applicant's claim 5 does not distinguish over the Hsiung et al. in view of Besser references.

It is argued, at page 8 of the Remarks, that Hsiung et al. and Pramanick et al. do not teach co-depositing a metal film and an additional metal species over insulating layer and in the opening and filling the opening with the metal film and the additional metal species, as claimed. This argument is not convincing because Hsiung et al. clearly teaches, as shown in Figures 3C-3D and Col. 3, line 59 - Col. 4, line 3, co-depositing a metal film and an additional metal species (35) over insulating layer (30) and in the opening and filling the opening with the metal film and the additional metal species. Therefore, Applicant's claim 18 does not distinguish over the Hsiung et al. reference.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

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will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

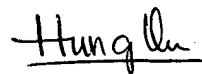
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hung K. Vu whose telephone number is (703) 308-4079. The examiner can normally be reached on Mon-Thurs 6:00-3:30, alternate Friday 7:00-3:30, Eastern Time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on (703) 308-1690. The Central Fax Number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Vu

April 26, 2004

A handwritten signature in cursive script, appearing to read "Hung Vu", written over a horizontal line.

Hung Vu

Patent Examiner